#8 Dec. 8-11-99 M.R.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

ARAKI et al : Group Art Unit: 1713

Application No. 08/934,396 : Examiner: Fred Zitomer

Filed: September 19, 1997 :

For: RUBBER COMPOSITION AND PNEUMATIC TIRE USING SAID RUBBER COMPOSITION

DECLARATION UNDER 37 C.F.R. §1.132

Honorable Commissioner of Patents and Trademarks

Washington, D.C. 20231

Sir:

I, Kazuhiro Yanagisawa, do declare and state as follows:

I graduated from The University of Tokyo with a Master's Degree in Engineering with a major in Chemical Energy Engineering in March 1993;

I joined Bridgestone Co., Ltd. in April 1993, and since that time I have worked mainly on fillers and coupling agents in

Bridgestone's Tire Materials Development Department;

I am a co-inventor of the subject matter disclosed and claimed in the above-identified application; and

I am familiar with the Office Action of February 5, 1999 and understand that the Examiner has rejected Claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over Yamauchi U.S. Patent No. 5,788,786 in view of Thurn U.S. Patent No. 3,873,489.

The following additional comparative experiment was carried out by me or under my supervision in order to make the advantages of the subject matter clearer.

Experiment

In the following coupling agents shown in the Table A, samples A to F are the same as those in Table 1 show on page 14 of the original specification filed, and sample G was prepared for this experiment.

The following experiment was carried out in order to demonstrate the inventive step of the present invention in which the distribution of the number of sulfur atoms in the silane coupling agent is specified.

Among the properties of sample G, the weight ratio of sulfur

included in the silane coupling agent and the average number of sulfur chains were substantially the same as those of sample B, but the following were different: trisulfide silanes were contained in the silane coupling agent in an amount of 20% or less, and high polysulfide silanes (i.e., polysulfide silanes wherein y is 5 or more) were contained in the silane coupling agent in an amount of 50% or more. Namely, the Comparative Example differed from the Examples of the present application only with regard to the distribution. Data obtained on the sulfur in the silane coupling agents used in the Examples of the present invention (samples A through F) and on the sulfur in the silane coupling agent used in the Comparative Example (sample G) are given in the following table.

Table A

	Distribution of each components having different number of sulfur atoms (%)								S_5 or more	weight ration of sulfur atom to the avarage molecular weight of in each sample	Average number of sulfur chains
	$-S_2-$	$-S_3-$	$-S_4-$	$-S_5-$	$-S_6-$	$-S_7-$	$-S_8-$	$-S_9-$			
sample A	2.53	15.81	23.77	24.27	18.33	10.24	3.83	1.18	57.85	23.1	3.9
sample B	**7.16**	**30.33**	**29.38**	**18.29**	**8.24**	**3.28**	**0.96**	**2.36**	**33.13**	**19.5**	**3.1**
sample C	17.64	44.14	23.40	8.49	1.92	1.06	3.37	0.00	14.83	16.9	2.6
sample D	8.1	59.0	18.7	14.2					14.20	18.6	2.9
sample E	11.1	62.8	26.1						0.00	17.9	2.8
sample F	97.3	2.7							0.00	13.6	2.0
sample G	**10.9**	**16.8**	**20.0**	**16.8**	**13.5**	**9.7**	**6.9**	**5.4**	**52.30**	**19.3**	**3.1**

The average number of sulfur chains listed in the rightmost column in the above table are calculated by the following formula.

percentage of sulfur(%)＝32.07 (i.e., the atomic weight of sulfur) × average number of sulfur chains／〔410.7 (i.e., the molecular weight of the portions of triethoxysilylpropylpolysulfide (the general formula on page 13, line 3) other than the sulfide portion)＋32.07 × the average number of sulfur chains〕× 100.

Rubber compositions obtained by using one of sample B or G and a test tire using the rubber compositions were prepared in accordance with the same composition and the same method as in Example 1 of the present application (in which sample B was used), and the physical properties were measured in the same way as in Example 1 of the present application. The results are given in the following table.

	Example 1	This Comparative Example
silane coupling agent	sample B	sample G
masterbatch temperature (°C)	164	164
expansion ratio (%)	22.3	21.7
Mooney viscosity (index)	91	128
ICE μ (index)	111	113
abrasion resistance (index)	115	108

The Mooney viscosity of the rubber composition using sample G was extremely high. Rubber compositions having higher Mooney viscosities have inferior processability and poor workability.

Conclusions

It can be understood from the result obtained that it is extremely important to stipulate the distribution of the number of the sulfur atoms in the silane coupling agent. A silane coupling agent which does not have the specific distribution of the present invention cannot exhibit the preferable physical properties of the present invention. Accordingly, even if one were to combine the Yamauchi and Thurn references, which do not stipulate the distribution of the silane coupling agent, one could not arrive at the present invention.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DATE: July 28, 1999

Kazuhiro Yanagisawa

Kazuhiro Yanagisawa